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Spillover Effects and Option  
Value in Education

*Walter McMahon*

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Spillover Effects and Option  
Values in Education

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## Abstract

These two short essays develop spillover effects in education and option values in education, and survey the recent research that attempts to measure the magnitude of each.

Spillovers are types of externalities that arise largely through the geographical spillovers associated with the migration of human capital. They include the benefits to other districts from increased tax receipts and reduced social welfare costs when persons migrate -- 87 percent of persons educated in one local school district that was studied moved to other districts, for example. The "brain drain" is a form of interregional and international spillover that drains the poorer region of highly trained manpower, and can contribute to underspending on education in the areas losing these persons.

The option value of education is the value the opportunity to obtain further education. It includes the value of a high school education as an "option ticket" necessary for admission to college, as well as the value of the options a college education offers for later learning on the job.



## Spillovers in Education

The spillovers in education are those benefits of education that spillover into other political jurisdictions, normally as the result of net outmigration. Spillovers are a type of externality, since they are a benefit that is not captured by the decision making unit within which the educational process occurs.

Their significance is largely due to the allocative inefficiency that occurs as educational benefits, including the social welfare cost savings due to education, are lost to other localities through outmigration. The local decision making unit that loses these benefits then is likely to spend less on education. Weisbrod (1964, p. 111) presents evidence that where there are spill-outs, less, in fact, is spent. Financial aids to localities spillover some of the costs, e.g. Hirsch (1969), to higher levels of government thereby compensating at least in part for the Weisbrod underspending effect.

The spillovers considered below are geographical spillovers--both spill-outs and spill-ins--experienced by local school districts, by states (or provinces), and by nations. The broader subject of externalities in education in general, of which spillovers are a part, will not be considered here other than indirectly, since the research on other externalities is covered in a closely related entry which the reader should see. International spillovers in education are also very important. They have come to be known more popularly as the "brain drain," and are covered in that separate entry in more detail than here.

## I. Research on Spillovers in Education

Human capital, created by localities, has benefits that are lost when the individuals in whom the skills are embodied by education migrate to other localities and regions or nations which in turn enjoy the benefits and cost savings.

### Spillovers from Local School Units

The spill-outs from local school units to other localities and regions are larger, proportionately, than the migration between regions or between nations. Weisbrod (1964, p. 53) estimated, for example, that 87 percent of the males educated within a suburban school system near St. Louis in the U.S. migrated to other suburbs, to the urban center, or to other states and nations. The benefits to others comes in the form of a 21 percent increase in tax receipts as a result of the increased earnings due to education, of which 43 percent is a spillover to the Federal Government, 28 percent to the state, 14 percent to the county, 2 percent to the urban center, and only 12 percent is retained by the suburb. Even of this 12 percent that stays in the locality, 87 percent is eventually a spill-out to other localities through the high rate of out-migration (ibid, p. 75, males only, 5 percent discount rate). There are additional spill-outs in the form of reduced public sector welfare and social costs in the receiving community, including reduced costs of crime, reduced unemployment compensation costs, and reduced remedial education costs, including benefits even to the Armed Forces. Weisbrod (1964, p. 92) estimates the reduced unemployment compensation costs alone due to the

education in one school district to be \$2,083,000 (when re-expressed in 1982 dollars), 87 percent or more of which is lost to other communities. The externality-type non-monetary benefits, such as knowledge of and commitment to the institution of a democratic society, also spillover and benefit other communities.

The spill-outs must of course be netted against the spill-ins. But for most communities these are by no means equal. Even if they were, the uncompensated community providing the education originally would still have an incentive to underspend if it lost most of its graduates and then in turn received replacements without cost. But replacements are not totally without cost, for if the underspending on education is too great, it is well known that firms and families with education are less likely to migrate to these localities and the community will not grow--see, for example, Heins (1976, pp. 14, 19). Although state aids and a desire to remain economically healthy both retard underspending, Weisbrod (1964, p. 111) finds in a multiple regression analysis that for each 1 percent net outmigration, communities spend (when converted to 1982 dollars) \$12.86 per pupil less on their local schools.

The implications for a national system of education have been addressed in Europe where the financing of educational systems is more centralized than in the highly decentralized system found in the United States. At a very early date, however, Edmund J. James (1911, p. 16) recognized these implications, remarking on "how many of our Western cities have grown strong because of the able and educated men who have come into them from the school districts of New England!"

More recently, the rural to urban migration, and especially the migration of rural blacks from poor rural schools in the south or Puerto Rico to northern urban ghettos has caused a spillover of social costs due to unemployment, welfare, crime, and remedial education rooted in the inadequate education provided by the poor areas in the South that has been very noticeable. Hirsch (1964, 1969) has studied spillover benefits and spillover costs by constructing an input-output matrix that identifies the net effects further, and Flora (1974, p. 4 and Table 2) has estimated the net loss to rural districts in Kansas at 35-43 percent of their education expenditures. State aids to human capital exporting localities, and national assistance that helps cover some of the social costs borne by communities receiving the less well educated, are extensive in Europe, but less significant (and being cut back) in the United States, and even less extensive in most less developed countries.

#### International Spillovers

International spillovers in education, which are known more popularly as the "brain drains," have long had and continue to have great significance. Migrations of human capital have been largely responsible, for example, for the transmission of the institutions of political democracy and of the industrial revolution from the classrooms and factories of England, and later from Germany and Scandinavia, to North America and to the other democracies of the Western World. Given the attraction of higher incomes, and the freedoms associated with these democratic institutions, the current emigration of highly trained manpower, including physicians, from poor to rich countries

analyzed by Ballendorf (1972), Bernard (1971), and others presents a very serious problem for less developed countries seeking economic development. The Berlin Wall and the rest of the wall between Eastern and Western Europe has as a major purpose retarding the loss of trained manpower through human capital spillovers. The spillovers when Fidel Castro exported the people from his jails to the U.S. in 1981, or the spillovers in education that have contributed to rapid economic development in Israel, offer additional examples.

A more restricted immigration policy that puts a premium on education for entry into the U.S. and Canada (e.g., the National Conference on Immigration Policy Report 1975), creates problems for economic development in the LDC's. If the Weisbrod (1964, p. 111) effect holds internationally, this could be expected to lead to less spending on education than would otherwise occur by the poor nations. The World Bank has assumed a very significant role in attempting to partially correct for the adverse effects of some of these international spillovers in education on the low income nations by aiding human capital development there. But changes in immigration policies and more widespread aid for human capital development in the LDC's would both contribute to allocative efficiency in the world and help reduce poverty.

## Option Value in Education

The option value in education is the value of the opportunity to obtain further education, and hence to obtain the private and social benefits that this further education is expected to convey. The option value is above and beyond the direct value of education already completed for increasing monetary or non-monetary returns--the option value for a high school education, for example, is not the earnings of a high school graduate but its value in permitting entry and success in college.

This article will cover the value of the "financial option," as well as the non-monetary "opportunity options." The latter include the opportunities for broadened employment choices, the opportunities for additional non-monetary consumption satisfactions, and the opportunities for "hedging" against technical change. The direct monetary returns to education and the private consumption benefits are covered in separate articles by those titles, as are the external benefits--all closely related entries which the reader should see.

### I. The Option Value in Education

There are both monetary and non-monetary values to the individual, and to the society, of keeping options for further training and future adaptability to changing conditions open.

#### The Financial Option-Value

The financial option return is the value of retaining an opportunity for increasing earnings later in life following the completion of



further education. It depends upon (as do the other options) (1) the expected value of the schooling if it is obtained, and (2) the probability that it will be exercised. The option value therefore is very high at the primary school levels, and diminishes as each additional level is attained--for example, as the highest level is completed, rising foregone earnings costs reduce its net value while the probability of going further also falls so that at the last stage the option value approaches zero.

There is no double counting involved when the option value is added to the direct market value in valuing a given level of education. For example, as pointed out by Weisbrod (1964, p. 21), who has pioneered in this subject, the value of a high school education by this approach is the sum of the high school graduate's earnings over the life cycle (discounted back to their present value, of course), plus the value of the financial option of going to college. The latter is in effect an option "ticket" or discount for possible future use--if it is used to purchase a college education, the rate of return expected will be a function of its cost net of the discount.

Mincer (1963) has also pointed out that an increased amount of formal schooling is also associated with the financial option of getting increased amounts of on-the-job training. Mincer's (1974) work also develops the importance of these opportunities for on-the-job training and experience that builds on prior schooling. Both expected and realized rates of return to a college education that include this growth of earnings due in part to additional learning on the job are developed by McMahon and Geske (1982, Chapter 7) by race, sex, type of institution, degree level, and occupational field.

### Non-Financial Options

A "hedging" option is also provided by education, especially by a more general academic curriculum when it precedes specialization, that enables the individual to adjust more readily to changing job opportunities, as pointed out by Weisbrod (1964, p. 23). This has been referred to more recently by T. W. Schultz (1975) as the "value of the ability to deal with disequilibria." He generalizes it to deal not just with job changes but also to the readjustments that must be made in all market and non-market behavior, the adaptation to technical change, and external benefits as discussed in a separate entry on externalities. Although more general education hedges against uncertainty, investment in specialized human capital still involves risk, as pointed out by Levhari and Weiss (1974), who also conclude that an increase in uncertainty per se can reduce the amount invested, and that the effect of uncertainty about returns can have ambiguous effects on the investment decision. This line of reasoning suggests that increased uncertainty may encourage shifts away from vocationally overspecialized curricula, and "back to the basics" of a more general curriculum whose hedging option value is higher.

Other options for non-monetary returns from further education parallel the kinds of private consumption benefits of education and externalities in education that are discussed under those entries. For example, there is the opportunity available through further education of securing jobs that include some non-monetary satisfactions such as those connected with being a college professor, as noted by Cohn (1979, p. 36), a minister, or a musician. These include not only a

degree of flexibility and freedom in work, but also the stimulation of ideas and art while relating to people, and so on. During non-market and leisure time hours, the range of options available in life-style, in security, and for other family members is widened. Weisbrod (1964) mentioned some minor examples of contributions to home production, such as filling out one's own income tax returns (valued at about \$700 million in fees saved in 1982 dollars), typewriting, and driving), but new research on many more is discussed in the entry on the consumption benefits of education. Finally, there is the option value of the external benefits of education, such as greater adaptability of the work force and contributions of education to the functioning of democracy and community life which has value from society's point of view.

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Related Entries

Brain Drain  
Consumption Benefits of Education  
Expected Rate of Return to Education  
Externalities in Education  
Monetary Benefits of Education  
Student Labor Market Expectations

References and Suggestions for Further Reading (Spillovers)

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